



Five-Year Review Report

Second Five-Year Review Report for Pagel's Pit Superfund Site Winnebago County, Illinois

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List of Acronyms

AOC	Administrative Order by Consent
AGQS	applicable groundwater quality standard of 35 IAC 811.320
ARARs	applicable or relevant and appropriate requirements
CFR	Code of Federal Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
cis-1,2-DCE	cis-1,2-dichloroethene
ESD	Explanation of Significant Differences
FS	feasibility study
GCCS	gas collection and control system
GMZ	groundwater management zone
HCTU	home carbon treatment unit
HI	hazard index
IAC	Illinois Administrative Code
IC	institutional control
IEPA	Illinois Environmental Protection Agency
ILCS	Illinois Compiled Statutes
IPCB	Illinois Pollution Control Board
LTRA	long-term remedial action
MCL	maximum contaminant level
msl	mean sea level
N	nitrogen
NCP	National Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
OU	operable unit
PCE	tetrachloroethylene (perchloroethylene)
PRP	potentially responsible party
RA	remedial action
RPM	remedial project manager
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RI	remedial investigation
RCD	Record of Decision
SVOC	semivolatile organic compound
TCE	trichloroethene
U.S. EPA	United States Environmental Protection Agency
UU/UE	unlimited use or unrestricted exposure
VOC	volatile organic compound

Executive Summary

The remedy for the Pagel's Pit Superfund site (Site), Winnebago County, Illinois, is set forth in a Record of Decision (ROD) dated June 28, 1991, for operable unit (OU) 1 and a ROD dated September 30, 1999, which amends the remedy for OU 1 and includes the remedy for OU 2. The remedy included:

- A sanitary landfill cover for the waste disposal area (OU 1);
- Leachate extraction and transfer of the leachate to the local publicly owned treatment works for treatment (OU 1);
- Gas extraction and the use of the gas for fuel or the flaring of the gas (OU 1);
- Restoration of the aquifer outside the waste disposal area and the zone of attenuation to drinking water standards via monitored natural attenuation with a contingency for the groundwater downgradient of the Site. The contingency remedy is an active system that would be implemented if it were determined that the groundwater contamination was not decreasing satisfactorily downgradient or the contaminated groundwater would become an immediate threat to a downgradient water supply (OU 1);
- Deed restrictions limiting the development of the property and the placement of new wells on the property and adjacent to the Site, including the area west of Killbuck Creek (OU 1), and limiting the placement of new wells on the southeast corner property (OU 2); and
- Site monitoring, including monitoring of the groundwater in the southeast corner, and maintenance of all remedial action components (OU 1 & 2).

The U.S. EPA noted construction completion in the ROD dated September 30, 1999. The construction of the cover was completed with the acceptance by the Illinois Environmental Protection Agency (IEPA) of the construction quality assurance report for the eastern portion in May 2002. The trigger for this second five-year review was the signing of the first five-year review on September 27, 2002.

The assessment of this five-year review is that the remedy was constructed in accordance with the two Records of Decision (RODs). The remedy is functioning as anticipated. The remedies for OU 1 and OU 2 are protective of human health and the environment in the short term because exposure pathways that could result in unacceptable risks are being controlled. Therefore the remedy for the entire Site is protective in the short term. Long-term protectiveness requires compliance with effective institutional controls (ICs). In order for the OU 1 and OU 2 remedies to be protective in the long term, additional ICs are necessary and the effectiveness of the ICs and long-term stewardship procedures need to be evaluated. In order for the remedy for the entire Site to be protective in the long term, the additional ICs are necessary and the effectiveness of the ICs and the long-term stewardship procedures need to be evaluated. Long-term stewardship requires that effective ICs are maintained and monitored, along with maintenance of the remedy components.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name (from CERCLIS): Pagel's Pit		
EPA ID (from CERCLIS): ILD980606685		
Region: 5	State: IL	City/County: Winnebago County
SITE STATUS		
NPL status: <input checked="" type="checkbox"/> Final <input type="checkbox"/> Deleted <input type="checkbox"/> Other (specify)		
Remediation status (choose all that apply): <input type="checkbox"/> Under construction <input checked="" type="checkbox"/> Operating <input type="checkbox"/> Complete		
Multiple OUs?* <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Construction completion date: <u>9/30/99</u>	
Has site been put into reuse? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
REVIEW STATUS		
Lead Agency: <input checked="" type="checkbox"/> EPA <input type="checkbox"/> State <input type="checkbox"/> Tribe <input type="checkbox"/> Other Federal Agency		
Author name: Bernard J. Schorle		
Author title: Remedial Project Manager	Author affiliation: U.S. EPA, Region 5	
Review period:** <u>9/02</u> to <u>9/07</u>		
Date(s) of site inspection: <u>6/28/07</u>		
Type of review: <input checked="" type="checkbox"/> Post-SARA <input type="checkbox"/> Pre-SARA <input type="checkbox"/> Non-NPL remedial action site <input type="checkbox"/> NPL State/Tribe-lead <input type="checkbox"/> Regional discretion <input type="checkbox"/> NPL-removal only		
Review number: <input type="checkbox"/> 1 (first) <input checked="" type="checkbox"/> 2 (second) <input type="checkbox"/> 3 (third) <input type="checkbox"/> Other (specify)		
Triggering action: <input type="checkbox"/> Actual RA on-site construction at OU # <input type="checkbox"/> Actual RA start at OU # <input type="checkbox"/> Construction completion <input checked="" type="checkbox"/> Previous five-year review report <input type="checkbox"/> Other (specify)		
Triggering action date (from CERCLIS): <u>9/27/02</u>		Due date: <u>9/27/07</u>

*-- "OU" refers to operable unit

**-- Review period should correspond to the actual start and end dates of the five-year review in CERCLIS

Issues:

- 1A. Institutional Controls (ICs) - The additional ICs specified in the 1999 ROD need to be implemented and existing ICs need to be reviewed.
- 1B. ICs - Along with verifying that effective ICs are in place for all areas that do not support unlimited use, long-term stewardship must be confirmed, which includes maintaining and monitoring effective ICs.

Recommendations and Follow-up Actions:

- 1A. ICs - The landfill owner has already been directed to perform an IC study and has already agreed to do perform the study.
- 1B. ICs - U.S. EPA will review the landfill owner's IC study and existing solid waste permit and develop an IC Plan to identify any required follow-up actions to confirm that effective ICs are in place, to plan for implementation of any additional ICs needed, and to verify that effective procedures exist for long-term Site stewardship.

Protectiveness Statement(s):

The remedies for OU 1 and OU 2 are protective of human health and the environment in the short term because exposure pathways that could result in unacceptable risks are being controlled. Therefore the remedy for the entire Site is protective in the short term. Long-term protectiveness requires compliance with effective institutional controls (ICs). In order for the OU 1 and OU 2 remedies to be protective in the long term, additional ICs are necessary and the effectiveness of the ICs and long-term stewardship procedures need to be evaluated. In order for the remedy for the entire Site to be protective in the long term, the additional ICs are necessary and the effectiveness of the ICs and the long-term stewardship procedures need to be evaluated. Long-term stewardship requires that effective ICs are maintained and monitored, along with maintenance of the remedy components.

**Pagel's Pit Superfund Site
Winnebago County, Illinois
Second Five-Year Review Report**

I. Introduction

The purpose of the five-year review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in a five-year review report. In addition, the five-year review report identifies issues found during the review, if any, and identifies recommendations to address them.

This Five-Year Review Report is being prepared pursuant to Section 121 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9621, and to the National Contingency Plan (NCP), 40 CFR Part 300. Section 121 of CERCLA states:

If the president selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each 5 years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section 104 or 106, the President shall take or require such action. The president shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The Agency interpreted this requirement further in the NCP. The NCP in 40 CFR 300.430(f)(4)(ii) states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

The United States Environmental Protection Agency (U.S. EPA) Region 5, which is the lead agency for the Pagel's Pit Superfund site (Site), has conducted this five-year review of the remedy implemented at the Site (the North Unit, also known as the Northern Unit, of Winnebago Reclamation Service's Winnebago Landfill) near Rockford, Illinois. This review was conducted for the entire Site by the remedial project manager (RPM) in the summer of 2007. This report documents the results of the review.

This is the second five-year review for the Site. The triggering action for this statutory review is the signature date of the first five-year review, September 27, 2002. The five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use or unrestricted exposure.

II. Site Chronology

Event	Date
Landfill began operation	07/17/1972
Discovered landfill gas escaping from the landfill and began gas extraction	approximately 1980
Fund-lead remedial investigation (RI) and feasibility study (FS) began	10/01/1984
Site proposed for the National Priority List (NPL)	10/15/1984
Placed as final on the NPL	06/10/1986
Administrative Order by Consent for the RI and FS	08/27/1986
Potentially responsible parties (PRPs) take over the RI and FS	08/27/1986
Reports for the RI and FS submitted	March 1991
Proposed plan for operable unit (OU) 1 released	04/16/1991
Public meeting to discuss proposed plan and RI and FS reports	04/25/1991
End of public comment period for the proposed plan for OU 1	05/16/2002
Record of Decision (ROD) for OU 1	06/28/1991
Consent Decree for OU 1 remedial design (RD) and remedial action (RA)	lodged 11/25/1992 entered 02/11/1993
Remedial Design initiated	12/14/1992
On-site mobilization for Remedial Action initiated (closure of western portion of landfill)	07/14/1997
Remedial Action started	08/08/1997
Construction quality assurance report for western portion submitted to State	02/23/1998
Western portion construction quality assurance report accepted by the State	06/18/1998
Proposed plan for OU 2 remedy and OU 1 remedy amendment released	August 1999
Public meeting to discuss OU 2 proposed remedy and OU 1 proposed remedy change	08/25/1999
Informal public meeting to expand on the discussion that began at 8/25/99 meeting	09/18/1999
End of public comment period for the 1999 proposed plan	09/11/1999
ROD for OU 2 remedy and OU 1 remedy amendment	09/30/1999
Construction completion under CERCLA	09/30/1999
Closure of eastern portion of landfill began	August 2000
Construction quality assurance report for eastern portion submitted to State	September 2001
Eastern portion construction quality assurance report accepted by the State	May 2002
First five-year review report	09/27/2002
Site inspection for the second five-year review	06/28/2007

III. Background

Physical Characteristics

The Pagel's Pit Superfund site (Site) is a former limestone quarry that has been converted into a solid waste disposal landfill. The landfill occupies approximately 47 acres and is approximately 5 miles south of Rockford in New Milford, a rural, unincorporated area of south Winnebago County, Illinois. In 1972, Rockford Blacktop Construction Company converted the limestone quarry into a landfill. The sides and bottom of the 35 foot deep pit were graded and lined with 2 inches of asphalt. The asphalt was then sealed with a coal tar sealer. A leachate collection system

covering the base of the landfill was also installed. Leachate was collected through perforated pipes which drained into a series of manholes. The leachate was then pumped from the manholes into a lined leachate pond on top of the landfill where it was aerated and periodically trucked to a wastewater treatment plant in Rockford, Illinois. In 1992, a sanitary sewer line was installed which connects the Site to the Rock River Water Reclamation District, a local publicly owned treatment works (POTW). Since then, leachate has been piped to the District by sewer line. A landfill gas collection system is also in operation at the landfill.

The original operational permit for the landfill was issued by the Illinois Environmental Protection Agency (IEPA) for the disposal of municipal wastes, and sewage sludge from the Rockford Sanitary District. In addition to municipal solid wastes, special wastes, including plating and painting sludges, and industrial wastes were accepted at the landfill.

In 1980, the Winnebago County Health Department (WCHD) responded to complaints by a neighboring homeowner of gas seeping into the basement of his home. Subsequent investigations by the WCHD and owners of the landfill found that methane and carbon dioxide gases, generated during the anaerobic decomposition of landfill materials, were migrating away from the landfill through the subsoils. Results of an investigation showed that methane gas was migrating in several directions from the refuse area. Based on this finding, the landfill owner installed a methane gas venting system to control the migration of gases from the Site. Subsequent monitoring performed after the installation of the gas venting system indicated that the system was controlling the lateral migration of gases from the landfill.

In 1981, the WCHD discovered organic chemical contamination in five nearby private wells. These wells were contaminated with varying levels (in excess of 400 parts per billion total) of several chlorinated ethanes and ethenes. The source(s) of the contamination were unknown at the time and potential candidates included Pagel's Pit and another property, Acme Solvents (located directly east of Pagel's Pit). Acme Solvents is a former industrial waste disposal property and Superfund site. In 1982, Acme Solvents was placed on the National Priorities List (NPL) and a remedial investigation and feasibility study (RI/FS) conducted in 1984 detected numerous organic and inorganic compounds including volatile and semi-volatile compounds, and polychlorinated biphenyls (PCBs) in the soils. In addition, a volatile organic contaminant (VOC) plume was identified in the groundwater beneath and around Acme Solvents. The contaminant plume was found to be migrating to the west-southwest from Acme Solvents. Pagel's Pit was placed on the NPL in June 1986.

Land and Resource Uses

The topography surrounding the landfill area is generally relatively flat to gently rolling. The landfill lies outside the 100-year floodplain of Killbuck Creek and is not within any designated wetland area. The surficial unconsolidated deposits in the area are predominantly glacial drift ranging from a thin mantle over the dolomite in the bedrock uplands to the east of the Site to greater than 70 feet in the bedrock valley west of the Site. The unconsolidated deposits are predominantly sand and gravel underneath and north of the Site, with silty clay to the south of the Site. The underlying bedrock surface is highly variable. The dolomite bedrock is generally

fractured but the intensity is variable. Chert layers or nodules were commonly noted on boring logs, as were vugs (void spaces).

The landfill is bounded on the west by Killbuck Creek and on the east by Lindenwood Road. Contaminated groundwater has migrated to the west side of Killbuck Creek, thus moving the boundaries of the Site beyond the creek. The creek is a perennial stream, which merges with the Kishwaukee River approximately 2.5 miles northwest of the Site. The Kishwaukee River merges with the Rock River approximately 1.5 miles northwest of the confluence of Killbuck Creek and the Kishwaukee River. The Site is located on a topographic high between Killbuck Creek to the west and unnamed intermittent streams to the north and the south.

Land use around the Site is a mix of agricultural, residential, commercial, and industrial. The population of Winnebago County was about 278,000 in 2000 with approximately 150,000 residents in Rockford.

History of Contamination

As previously discussed, Pagel's Pit was originally a limestone quarry that was converted into a solid waste landfill, permitted by IEPA. Upon discovery of contamination in residential wells by WCHD, and further investigatory work, both Acme Solvents and Pagel's Pit were placed on the NPL.

Groundwater sampling in 1990 indicated that the general direction of groundwater flow within the upper aquifer, in the area including Pagel's Pit and Acme Solvents, was from east to west. Therefore, contamination released from Acme Solvents traveled through the groundwater towards Pagel's Pit. Part of the cleanup work mandated for Acme Solvents was the installation of a pump-and-treat system with downgradient extraction wells approximately half-way between the two sites and mass extraction wells closer to Acme Solvents. This system was placed into full-scale service in January 1996. The downgradient extraction wells were taken out of service in January 2000. Operation of this system has affected the groundwater flow directions between the two sites. The purpose of this system is to prevent or minimize the movement of contaminated groundwater from Acme Solvents toward the west, northwest, and southwest. The treated water is discharged into the intermittent stream that flows across the Acme Solvents property and lies north of Pagel's Pit. This intermittent stream discharges into Killbuck Creek. However, under typical conditions, the water infiltrates into the ground before it reaches Killbuck Creek.

Pagel's Pit includes numerous areas. What is now known as the North Unit is the original quarry. It opened for business on July 17, 1972, as a solid waste landfill and was sequentially constructed and filled in several sections. Municipal refuse and sewage treatment plant sludge have been the primary wastes accepted at the Site. Non-hazardous Illinois special wastes [defined in 35 Illinois Administrative Code (IAC) Part 810 as "industrial process waste, pollution control waste or hazardous waste, except as determined pursuant to section 22.9 of the act and 35 Ill. Adm. Code 808"] have also been disposed of at the facility. Development generally occurred in an east to west direction. However, the western portion was the first area to reach the allowable height under the IEPA permit. This unit ceased accepting solid wastes in 2000 when it

reached its permitted capacity; it encompasses approximately 42.7 acres. The operator is now operating a new landfill (which is not part of the Superfund Site), located south of the North Unit. This non-Superfund operating landfill is known as the South or Southern Unit. It will ultimately encompass approximately 27.5 acres. Both the North Unit and South Unit are part of the single IEPA permit, Permit No. 1991-138-LF. These two units, the groundwater monitoring wells, and some other features near Pagel's Pit are shown in Figure 1. Presently, wastes are also being disposed of on the land between the North and the South Units. This area is known as the South Unit Expansion, also not part of the Superfund Site. At the time when the permitted height is reached, the two units will appear to be one unit.

The landfill liner was constructed by grading and compacting the base and side walls of the landfill. Asphaltic concrete was installed over the sides and floor and compacted, resulting in a minimum two-inch thick layer. The surface of the asphalt was sealed with a cationic coal tar sealer. This sealed asphalt liner was covered with eight inches of sand. A network of perforated pipes was installed in the sand on the sloping base. The pipes were connected to manholes, where the liquid that drains from the wastes (leachate) is collected. However, this original leachate collection system no longer functions. The leachate is now pumped from landfill gas extraction wells to a tank on the landfill's property. Once in the tank, the leachate is pumped through a force main to a sewer. The sewer is connected to the wastewater treatment plant in Rockford, Illinois. Landfill gas is also collected and is presently flared.

As previously noted, Pagel's Pit was proposed for inclusion on the National Priorities List (NPL) in October 1984 and added to the NPL in June 1986. Operable unit (OU) 1 of the Site comprises the landfill wastes and contaminated groundwater downgradient of the Site. Operable unit 2 of the Site is the groundwater contamination at the southeast corner of the Site which was still under investigation at the time the ROD was signed for OU 1. Specifically, U.S. EPA separated the project into two OUs because the source of the contamination in the southeast corner had not been determined at the time of the 1991 ROD. The southeast corner was shown in the 1993 Consent Decree as a strip of land that extended from the waste boundary along the south side of the North Unit south to the then landfill property boundary. On the west it began a short distance east of the southernmost point of the waste disposal area and extended on the east to Lindenwood Road.

Initial Response

U.S. EPA and a subset of the potentially responsible parties (PRPs) for the Site reached an agreement, embodied in an Administrative Order by Consent (AOC), with an effective date of October 16, 1986, that required performance of a remedial investigation and feasibility study (RI/FS) at the Site. The reports for the RI/FS were submitted in March 1991. Additional investigations were carried out under this AOC and a 1993 Consent Decree (CD).

Based on the data from the RI, the water table occurs in the fractured dolomite bedrock east of, and below, the eastern quarter of Pagel's Pit. Under the remainder of, and west of Pagel's Pit, the water table occurs in the unconsolidated deposits. Groundwater flow in the area around Pagel's Pit and Acme Solvents is from east to west in the upper aquifer. However, at Acme Solvents and along the southern edge of the waste disposal area of the North Unit, the flow is to

the west-southwest (with the direction of flow more southerly at Acme Solvents). Along the northern edge of the waste disposal area the flow is toward the west-northwest.

A proposed plan for OU 1 was released to the public on April 16, 1991. This proposed plan presented a number of alternatives as possible remedies for the problems that had been identified at the Site. The proposed plan also included a description of the remedy preferred by U.S. EPA and IEPA. The ROD for OU 1, presenting the remedy selected for the Site, was signed on June 28, 1991. As previously discussed, OU 1 included the entire Site except the contaminated groundwater in the southeastern portion. The remedy called for the state-required landfill closure when the landfill reached capacity, including a cover and leachate and gas management systems, and a groundwater pump-and-treat system for the downgradient groundwater. Final cover and final leachate and gas management systems for approximately the western third of the landfill were installed in 1997, and the cover and management systems were installed for the rest of the landfill in 2000 and 2001.

The operator of the landfill is performing the remediation under the CD entered in February 1993. In a second ROD, issued in 1999, no action was selected as the remedy for the groundwater in the southeast corner, and the remedy for the groundwater to the west was changed to monitored natural attenuation (MNA) with a contingency for active remediation if the source control and natural attenuation do not appear to be satisfactorily returning this aquifer to a useful state, or if the contamination threatens downgradient wells. The groundwater between Pagel's Pit and Acme Solvents is addressed by a pump-and-treat system built for Acme Solvents.

Chloride ions serve as an indicator of leachate from the landfill affecting groundwater (chloride ions are generally recognized as a conservative, non-reactive parameter in groundwater systems). Based on April 1998 data, the area containing elevated chloride ion concentrations extended from about midway along the north border of the landfill [east of well G15S (B15R)¹], around the western end of the landfill, and along the south border of the landfill to at least the southwest area [well R42aS (G115)]. Refer to Figure 2 for the well locations. This is the area that may have been affected by landfill leachate prior to the initiation of any remediation work. Generally, the affected area was relatively close to the waste boundary (within 100 to 200 feet), but a well on the other side of Killbuck Creek (well G34S) also had an elevated chloride ion concentration. Other wells west of the creek sometimes had elevated chloride ion concentrations in 1998 and before, particularly well G35D.

In accordance with IEPA operating permit, applicable groundwater quality standards (AGQSs) have been established for substances that may be present at Pagel's Pit. The AGQS established for any constituent is the background concentration or an Illinois Pollution Control Board established standard. Refer to 35 IAC 811.320 for further information about AGQSs. Part 811 of 35 IAC is entitled "Standards for New Solid Waste Landfills." As used here, background concentration means the concentration of a constituent that is established as the background in accordance with the Illinois regulations. Statistical tests and procedures are used in determining the background concentrations. The AGQS values for the North Unit were derived from wells

1. The former designation of a well is given in parenthesis. Some wells do not have a former designation.

G09M, G09D, G13S, G13D, and G20D. However, only well G20D has been designated by IEPA as upgradient. The concentrations in all of these wells have been influenced by the Acme Solvents; this is especially true for well G20D.

The AGQSs are not the cleanup standards required by the 1991 ROD. The cleanup standards required by the ROD are the maximum contaminant levels (MCLs) or non-zero maximum contaminant level goals (MCLGs), except that a cumulative carcinogenic risk of 1×10^{-5} and a cumulative hazard index (HI) of 1.0 are to be used for 1,1-dichloroethene, arsenic, and those contaminants without MCLs. However, groundwater cleanup standards below detection limits using U.S. EPA approved methods for analysis of drinking water might be modified. Maximum contaminant levels and the 1×10^{-5} risk level were selected because concentrations in the neighborhood of 1×10^{-6} risk are often below reasonably achievable detection levels. Because of the way the AGQS is determined, it may be greater than the MCL or other cleanup standard that has been established.

The AGQSs are used in defining a groundwater management zone (GMZ) in the downgradient direction. The GMZ consists of the area where concentrations exceed the AGQSs. The GMZ is a three dimensional region containing groundwater being managed to mitigate impairment caused by the release of contaminants from a site. It is subject to a corrective action process approved by IEPA. (35 IAC 620.250 and 35 IAC 811.324 and 811.325) At Pagel's Pit, the initial GMZ was defined by the extent of the chloride and ammonia contamination. The AGQS for chloride, dissolved and total, is 87.5 mg/l and the AGQS for dissolved ammonia-nitrogen is 0.9 mg/l. Roughly, in 1995, the GMZ, based on both the upper and lower zones, included the area from about the mid-points of the waste disposal area on the north and the south borders toward the west to the vicinity of well nests G16 (G116) and G34.

There is also a zone of attenuation around the waste disposal area within which concentrations of constituents in leachate discharged from the unit may exceed AGQSs. The unit is a contiguous area used for solid waste disposal. This zone is a volume bounded by a vertical plane at the property boundary or 100 feet from the edge of the unit, whichever is less, extending from the ground surface to the bottom of the uppermost aquifer and excluding the volume occupied by the waste. Once the groundwater concentrations in the GMZ are at or below the AGQSs, there will no longer be a GMZ. However, the zone of attenuation will always exist.

Volatile organic compounds (VOCs) have been found in the past in the shallow aquifer on, and in the vicinity of, both Pagel's Pit and Acme Solvents. Volatile organic compounds have been found both inside and outside of the area defined by elevated chloride concentrations. During the 1988-90 remedial investigation, the highest concentrations of VOCs were found in wells on or near Acme Solvents. The next highest concentrations were found in the southeast corner of Pagel's Pit. During this initial RI work, a connection between Acme Solvents and the southeast corner of Pagel's Pit was not definitely shown due to complexities of the aquifer systems (unconsolidated and bedrock fracture groundwater systems). In subsequent investigatory work, well G20D (G120B) was installed between Pagel's Pit and Acme Solvents. Elevated levels of VOCs were found in water in this well, which demonstrated that contamination was moving from Acme Solvents toward Pagel's Pit. Thus it was shown that at least some of the VOCs present in the southeast corner could have come from Acme Solvents. However, it is likely that

some of the contamination in the southeast corner was also coming from Pagel's Pit. Chlorinated benzenes were found in this area, but were not found in wells closer to Acme Solvents.

In the GMZ during 1997 and 1998 (closure of the western portion of landfill began in August 1997), tetrachloroethene was the only organic compound whose concentrations exceeded the MCLs established under the Federal Safe Drinking Water Act [MCL = 5 micrograms per liter ($\mu\text{g/l}$)]. The MCL for tetrachloroethene was exceeded in wells G16M (G116A), G16D (G116D), and G35S to the west of Killbuck Creek and in wells G41D (G132), G39S (G39), and G03M (P4R) to the east of the creek. The maximum concentration was 12 $\mu\text{g/l}$, so the AGQS, which is 26 $\mu\text{g/l}$, was not exceeded. The concentrations of several other organics exceeded their AGQSs in the GMZ, including those of 1,4-dichlorobenzene in four wells. Three of these wells are in or very close to the zone of attenuation and the fourth is directly downgradient of the landfill. In the "background" wells (well G20D (G120B) and four of the five wells [not including well G14D (G114) in the southeast corner], the concentrations of several substances exceeded their MCLs: tetrachloroethene in wells G09D (G109A) and G13D (G113A); trichloroethene in wells G20D (G120B) and G13D (G113A); cis-1,2-dichloroethene in well G13D (G113A); vinyl chloride in well G13D (G113A) [the MCL was also exceeded in well G14D (G114)]; and 1,2-dichloropropane in well G13D (G113A). The concentrations of a few other organics exceeded their AGQSs in the southeast corner wells, including 1,2,3-trichlorobenzene, 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, and chlorobenzene. These numbers demonstrate the low levels of VOCs generally found in the GMZ. They also show the possible influence of Acme Solvents on the groundwater in the southeast corner because of the presence of several chlorinated ethenes. Well G20D (G120B) and the wells in the southeast corner are not part of the GMZ since they are not considered to be downgradient of the waste disposal area. The fact that chlorinated ethenes and chlorinated benzenes were found at higher concentrations in the southeast corner wells than in wells further downgradient demonstrated that natural attenuation processes were taking place.

Killbuck Creek is also regularly monitored by the landfill operator. In 1998, none of the major chlorinated ethenes were detected in the creek, nor were several other VOCs, for which analyses were done. The ammonia concentrations in the creek generally increased between the upstream and downstream sampling points, which may indicate an effect from the landfill. However, the chloride concentrations increased only slightly.

The results of the monitoring of the landfill leachate in the 1997 to 1999 period showed that the chloride and sodium concentrations in the leachate were generally somewhat higher than the ranges for typical landfill leachate. During this period there were no detections of chlorobenzene, 1,4-dichlorobenzene, the two trichlorobenzenes, 1,2-dichloropropane, or any of the major chlorinated ethenes in the leachate.

An investigation for the remedial design of the OU 1 barrier well system specified in the 1991 ROD found that pumping a well located between the waste disposal area and the creek resulted in a much greater flow rate than had been anticipated when the ROD was issued. Also, the groundwater downgradient of the landfill was found to contain significant concentrations of ammonia. Ammonia had not been considered in the remedial investigation done for this ROD. If this groundwater were extracted as part of a system to prevent the movement of the contaminated groundwater downgradient, this ammonia would have to be removed before the treated

water could be discharged, unless the concentrations were significantly decreased during pumping because of the introduction into the groundwater of uncontaminated water from the creek flowing to the extraction wells through the ground. Generally, the removal of ammonia would involve raising the pH, stripping the ammonia, and then lowering the pH of the water to an acceptable level for discharge. These results led to the determination that the cost of the barrier well system and associated water treatment system would be much greater than had been estimated for the 1991 ROD, and the Agency agreed to defer implementation of the systems until alternatives could be investigated.

A proposed plan for the remedy for OU 2 and for a change in the remedy for OU 1 was released to the public in August 1999. This proposed plan also informed the public of the dates for the comment period, August 13, 1999 through September 11, 1999, and the public meeting held on August 25, 1999. At the request of some attendees at the August 25th public meeting, a second meeting was held on September 8, 1999, to further discuss the proposed plan. The ROD for OU 2, which also served as a ROD Amendment for OU 1, was signed September 30, 1999.

Basis for Taking Action

In the 1991 RI, a baseline risk assessment was performed to characterize the nature and estimate the magnitude of potential risks to public health and the environment. The potential risks were caused by the chemicals of concern and were based on current and possible future land use. The scenario pertaining to potential future groundwater use as a water supply was found to represent the greatest risk to humans at Pagel's Pit. Under this scenario, exposure would occur through groundwater ingestion and from dermal contact and inhalation while bathing. The calculation was performed for groundwater west of Lindenwood Road, including the southeast corner. The calculated cumulative hazard index (HI) of 5, not including cobalt exposure found in only one well, compared to the Superfund goal of an HI of 1, indicated that exposure to the noncarcinogens in the groundwater might cause adverse health effects. The majority of the value of the HI was due to exposure to 1,2-dichloroethenes, thallium, and zinc. The calculated cumulative cancer risk of 1×10^{-3} exceeded the U.S. EPA target risk range of 10^{-4} to 10^{-6} . The majority of this risk was due to exposure to vinyl chloride and arsenic.

The total 1,2-dichloroethene concentration (the lesser of the 95% upper-bound confidence limit of the arithmetic mean or the maximum concentration detected) used in the calculation for the risk in 1991 was 240 µg/l. [A risk or hazard quotient (the sum of the hazard quotients for substances that cause a similar effect is the hazard index) is directly proportional to the concentration; if the concentration has decreased, so has the risk or hazard quotient]. In April 1998, there were only five detections of 1,2-dichloroethene (all of the cis isomer) in the groundwater west of Lindenwood Road (31 wells sampled): 98 µg/l in well G13D (G113A) in the southeast corner and concentrations ranging from 6 to 7 µg/l in four downgradient wells. The detection limit was 5 µg/l. The dissolved thallium concentration used for the 1991 risk assessment was 2.8 µg/l (ranging from 2 to 6 µg/l). In April 1998, there were only two detections of total thallium (dissolved thallium was not analyzed for) at about 5.3 µg/l. The detection limit was 5 µg/l. The two thallium detections were in wells from the same general area. No thallium was detected in the leachate in the 1997 through early 1999 period, with detection limits of 1.5, 2.2, and 100 µg/l. The dissolved zinc concentration used for the 1991 risk assessment was 6.3 mg/l (ranging from

0.037 to 6.34 mg/l). In April 1998, there were 25 detections of dissolved zinc in the wells west of Lindenwood Road (31 wells sampled), ranging in concentration to 9.27 mg/l [in well G09D (G109A)], in the southeast corner, where the next highest concentration was 1.73 mg/l in well G09M (G109). The maximum in the downgradient wells was 4.18 mg/l. Hence, all but one of the detections of zinc was below 6.3 mg/l. The detection limit was 0.022 mg/l. The vinyl chloride concentration used for the 1991 risk assessment was 14 µg/l. In April 1998, there was only one detection of vinyl chloride, at 15 µg/l, and this was in a southeast corner well. The detection limit was 2 µg/l. The dissolved arsenic concentration used for the 1991 risk assessment was 8.4 µg/l (ranging from 2 to 46 µg/l). In April 1998, there were ten detections of dissolved arsenic, ranging in concentration to 25 µg/l, but eight of the detections were below 8.4 µg/l. The detection limit was 2 µg/l. Thus, the concentrations of the substances that were the significant contributors to the risks calculated in 1991 have generally been decreasing or remaining similar to the levels then, but it is clear that risks were still present above U.S. EPA's requirements for remedial action in 1999.

Because of the unacceptable risk levels revealed by the human health evaluation, a remedy was developed for Pagel's Pit. The primary risks were from the vinyl chloride and arsenic in the groundwater. Landfill gas was also identified as a problem. The remedy implemented reduces leachate and prevents contact with wastes within the landfill, contaminated groundwater and landfill gas.

IV. Remedial Action

Remedy Selected

The total remedy that has been selected for the Site (for both OU 1 and OU 2) as a result of the 1991 ROD and the 1999 ROD consists of the following components:

- A sanitary landfill cover for the waste disposal area;
- Leachate extraction and transfer to the local publicly owned treatment works for treatment;
- Gas extraction and the use of the gas for fuel or the flaring of the gas;
- Monitored natural attenuation (MNA) with a contingency² for groundwater downgradient of the Site;
- Deed restrictions that protect the source control measures through restrictions on construction and that prevent contact with contaminated groundwater through well installation restrictions in those areas containing contaminated groundwater, including areas west of Killbuck Creek; and
- Site monitoring, including monitoring groundwater in the southeast corner, and maintenance of all remedial action components.

2. An active program to prevent contaminant transport and/or remove contaminated groundwater (whichever is needed if monitoring data demonstrates that natural attenuation processes do not lead to the required cleanup levels, or if a downgradient waste supply becomes immediately threatened by contamination).

The remedy for OU 2 (the groundwater in the southeast corner) was institutional controls, which consist of deed restrictions prohibiting the installation of water production wells in that area. The groundwater will continue to be monitored as part of the operation of the landfill. It was determined that the contaminated groundwater in the southeast corner would move toward the west and join with the other contaminated groundwater, which was being addressed as part of OU 1.

The remedy for OU 1 is that listed above for the total remedy except for the institutional controls specifically for the southeast corner.

Remedy Implementation

This section covers implementation of the OU 1 remedy. The remedy for OU 2, the placement of institutional controls in the southeast corner, has not been implemented yet. In addition, institutional controls for the property on the west side of Killbuck Creek (part of OU 1) have not yet been implemented.

The final cover was constructed in two phases. First, the 16.6 acre cover was installed on the western portion of the landfill after the wastes had reached the permitted elevation. This work started in July 1997. The design for this portion of the landfill was approved on August 8, 1997. *Construction Quality Assurance Acceptance Report Pagel Landfill Final Construction, Western Portion*, February 1998, was submitted to IEPA on February 23, 1998. The report was accepted by IEPA on June 18, 1998.

Final cover construction for the eastern portion of the landfill started in August 2000, after the wastes had reached the permitted elevation in the rest of the landfill. *Construction Quality Assurance Acceptance Report Pagel Landfill Final Cover Construction--Eastern Portion*, September 2001, was submitted to IEPA in September 2001. Following the submission of some additional information, the report was accepted by IEPA in May 2002.

For both portions, the work consisted of the following components:

- Grading layer;
- 1-foot recompact clay layer;
- 40-mil flexible membrane liner;
- Drainage layer;
- 2.5-foot protective layer;
- 6-inch topsoil layer with fertilizer, seed, and mulch;
- Storm-water terraces, letdowns, ditches, and culverts;
- Leachate extraction (leachate wells and pumps and associated piping) and conveyance system; and
- Gas collection system, including connection to a flare system.

The gas collection and control system (GCCS) included 35 vertical dual leachate/gas extraction wells, collection piping network, and leachate storage tanks. The collected gas was being directed to a flare at the time of the 2002 review. There are gas probes located outside the waste

boundary, which are monitored. The landfill was issued a Title V--Clean Air Act Permit Program (CAAPP) permit and a Title I Permit on December 30, 2002.

It has been necessary to perform additional work on the leachate extraction system because of problems encountered with the in-well pumps. Consequently, the lowering of the leachate level in the landfill has been slow. At the present time, the leachate levels are essentially at the pump intake levels.

There were problems controlling landfill gas after cover construction was completed. A larger capacity system for handling the gas was installed in September 2002. By mid-September 2002, the new system became operational.

Construction completion for the Site was deemed to have been achieved with the issuance of the 1999 ROD on September 30, 1999, which acknowledged that U.S. EPA's response at the Site was complete. All remaining construction activity was to be completed by the operator of the landfill in accordance with the requirements of Operating Permit No. 1991-138-LF issued by IEPA's Division of Land Pollution Control. The long-term groundwater monitoring requirements of the 1999 ROD were already specified in the 1993 Consent Decree and were also required under the operating permit. Cost figures for the construction of the final cover are not presently available.

Institutional Controls

Institutional controls (ICs) are non-engineered instruments, such as administrative and legal controls, that help to minimize the potential for exposure to contamination and that protect the integrity of the remedy. Institutional controls are required to assure long-term protectiveness for any areas which do not allow for unlimited use or unrestricted exposure (UU/UE).

The deed restrictions for the waste disposal area and those areas nearby that were required under the 1991 ROD were implemented. A copy of the deed restriction form contained in the 1993 CD, notarized on April 19, 1993, was recorded. The document includes restrictions on the use of the upper aquifer, prohibits residential use of the property, requires that any changes to structures, roads, etc. be approved by U.S. EPA, prohibits tampering with or removal of any containment or monitoring systems or other components of the remedial action unless authorized by U.S. EPA, and prohibits interference with the performance of the work or remedial action or with the maintenance of remedial measures. Additional restrictions required by the 1999 ROD must still be implemented. The specific areas which do not allow for UU/UE are summarized in Table 1 on the following page.

Table 1. Institutional Controls Summary Table

Media, Engineered Controls, and Areas That Do Not Support UU/UE Based on Current Conditions	IC Objective	Title of Institutional Control Instrument Implemented
Constructed landfill cover and surface area of property beyond the landfill cap in OU 1	No residential use. Agricultural use must be approved by U.S. EPA. Any installation, removal, or construction of any buildings, wells, pipes, roads, ditches or any other structures must be approved by U.S. EPA. Unless authorized by U.S. EPA, no one shall tamper with or remove any containment or monitoring systems or any components of the remedial action. There shall be no interference with the performance of the work or remedial action or with the maintenance of remedial measures.	Deed restriction.
Groundwater for OU 1, at the Site	Prohibit use of groundwater where contamination exceed cleanup standards.	Same as above.
Groundwater for OU 1, off the Site	Prohibit use of groundwater where contamination exceed cleanup standards.	None.
Groundwater for OU 2 (southeast corner)	Prohibit use of groundwater.	None.

More detailed maps (paper and GIS versions) which depict the physical areas for the information contained in Table 1 will be developed as part of an IC Study. The maps will include current conditions for the Site and areas which do not allow for UU/UE.

A review of the ICs is needed to verify that the remedy is functioning as intended with regard to the ICs and to ensure that effective procedures are in place for long-term stewardship at the Site. The existing deed restriction must be evaluated and ICs must still be implemented for the additional requirements made in the 1999 ROD for the southeast corner and the downgradient groundwater. At the time of the 1991 ROD, the operator did not own the affected property. This property is now owned by the operator.

To ensure the long-term effectiveness of the ICs, an IC study has been requested from the landfill operator. The operator has agreed to perform the IC evaluation activities. Institutional control evaluation activities will include performing title work to verify ownership and whether prior-in-time encumbrances may interfere with the ICs, preparation of maps (paper and GIS), and evaluation whether additional ICs are needed. The IC evaluation activities will also evaluate whether effective procedures are in place for long-term stewardship to assure proper maintenance

and monitoring of effective ICs. This would include regular inspection of ICs at the Site and annual certification to U.S. EPA that ICs are in place and effective. Additionally, use of a communications plan and use of one-call system should be explored for long-term stewardship. Once the IC evaluation activities have been completed, an IC Plan will be developed by U.S. EPA within six months of the five-year review. The Plan will incorporate the results of the evaluation activities and plans for additional IC activities as needed, including planning for long-term stewardship.

Systems Operation and Operation and Maintenance

The landfill's operator performs the operation and maintenance required under Illinois regulations for a closed landfill which includes:

- Groundwater monitoring;
- Cap inspection and maintenance;
- Operation and maintenance of the leachate extraction system, including leachate disposal to the local publicly owned treatment works through a force main to the sewer; and
- Operation and maintenance of the landfill gas extraction system, which presently includes a flare for the disposal of the gas.

The North Unit has twenty-four groundwater monitoring points; five are designated as background monitoring points, one is a compliance boundary well at the edge of the zone of attenuation, and the rest are zone of attenuation wells. There are four leachate monitoring points and three surface water sampling locations. The points are sampled quarterly for one list of parameters and annually for an additional list of parameters. There are thirty-one monitoring wells (many of these are included in the twenty-four mentioned above) and the three surface sampling points that are designated GMZ wells and these are analyzed for the GMZ parameters. There are a number of gas probes around the waste disposal area of the North Unit that are sampled monthly. Results are reported after the analytical results are available. U.S. EPA has no information on the specific costs of operation and maintenance at this time. The activities being conducted by the operator are required by the IEPA permit.

V. Progress Since the Last Five-Year Review

The issues listed in the 2002 five-year review report were mostly matters related to construction work, which at that time, had only recently been completed:

1. The new ICs required by the 1999 ROD had not been implemented (an issue that still remains);
2. Landfill gas was migrating beyond the waste boundary though a new flare system had just been installed. However, since that time, this system has been operating though some gas is still beyond the boundary. Operation of the Winnebago Energy Center is planned to begin in November or December 2007. The Center will contain four CAT 3520 internal combustion engines that will use the landfill gas as a fuel and that will drive electrical generators. The landfill gas from the North Unit is currently kept separate from that from the South Unit. If there is too much gas for the engines, the excess will be flared.

3. Groundwater contamination - MNA monitoring required as part of the remedy.
4. Leachate levels in the landfill were still high. Leachate levels are now lower, at the levels of the pump intakes, and require continued monitoring.
5. Small areas of the cover needed repair and proper vegetation cover. This has been addressed.

Table 2: Actions Taken Since the Last Five-Year Review

Issues from Previous Review	Recommendations/ Follow-up Actions	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
new ICs required	implement ICs	PRP	end 2003	None	none
landfill gas migration	bring landfill gas under control	PRP	end 2002	new gas extraction system installed; still some gas outside	late 2002 and on-going.
extent of groundwater contamination	monitor groundwater	PRP	ongoing	monitoring ongoing	NA
cover vegetation	repair vegetation and erosion	PRP	ongoing	cover has improved	NA
leachate levels too high	remove leachate	PRP	ongoing	leachate levels are satisfactory	NA

Since the last five-year review, the landfill operator has begun placement of wastes in the area between the North Unit and the South Unit; this area includes most of the southeast corner. This is the South Unit Expansion and it has been permitted by IEPA and is not considered part of the Superfund Site. The monitoring wells and gas probes that were in this area were abandoned. The vegetative soil of the North Unit cover was removed in the area where wastes are to be placed; at least 2 feet of the protective soil layer of the cover for the North Unit was left in place and lies below the liner system of the South Unit Expansion. However, at both ends of this area the protective soil and the drainage layer of the North Unit were removed and replaced by one foot of sand. This area, where wastes are to be placed, was covered by a geosynthetic clay liner and then a drainage layer like that used for the South Unit; this is the liner system for the South Unit Expansion in this area. Wastes are placed above this drainage layer. This method of construction results in the leachate generated by the wastes placed in the South Unit Expansion draining to the leachate collection system of the South Unit, rather than draining into the North Unit.

VI. Five-Year Review Process

Administrative Components

The IEPA and the landfill operator were formally notified about this five-year review through a November 6, 2006 letter from U.S. EPA's Remedial Project Manager (RPM), Bernard Schorle.

Community Notification and Involvement

An ad appeared in the *Rockford Register Star* July 12, 2007, informing the community that a review was to take place, listing the major components of the remedy, and informing them where additional documents could be found. The public was also told that they could submit comments concerning the Site to U.S. EPA. No comments were received. See Figure 3 for a copy of the ad.

There is an information repository for the Site located at the Rockford Public Library. The five-year review reports can also be obtained through the Internet at <http://www.epa.gov/region5/superfund>.

A second notice announcing the completion of the five-year review and the availability of the report will be issued once the report is signed.

Document Review

For this review, the monitoring reports submitted to U.S. EPA and IEPA from the landfill operator were reviewed. The main report consulted for this review was the *Status Report* dated May 2007. This report included a table that contains historical groundwater analytical data for the period beginning with the first quarter of 1997.

Data Review

In the May 2007 *Status Report* figures are included that show the extent of the upper and lower zones of the groundwater management zone (GMZ) in 1995 and in 2007; the landfill applied to the state in 1995 for permission to create a GMZ. (See the "Initial Response" subsection above for a discussion of the GMZ.) The 1995 GMZ was based on one sampling event and its depiction was made prior to the closing of the North Unit. In the upper zone the extent is similar in the two years. In 2007, it extends from the western edge of the southernmost point of the waste disposal area around the western edge close to well G41S to the northern edge about 350 ft west of well G15S. In this area it is on the west side of Killbuck Creek. There is another part of it that encompasses the area around wells G34S and G35S. In 1995 wells G41S and G34S were not inside this GMZ but in 2007 they were. In 2007, there was also a part of the GMZ around well G37S. See Figure 2 for the locations of the wells, gas probes (GP), and surface water sampling points (SG).

The lower zone of the GMZ has changed considerably between 1995 and 2007. In 1995, the zone extended from a point at the waste boundary about 300 feet west of the southernmost point of this boundary around wells G16M and G37D, but not including well G34D, and then intercepting the northern waste boundary at about the same point where the upper zone joins it. In 2007 the lower zone is shown in four small areas: 1) an area that extends out from the western edge of the waste disposal area and encompasses well G38S; 2) an area that extends out from the western edge of the waste disposal area and encompasses wells G41M and G39S but not well G03M; 3) a small area around well G16M; and 4) a small area around well G34D.

A graphic vertical depiction for 2007 shown along an east-west profile extending from well G20D to about well G35D through the area between the North Unit and the South Unit shows the GMZ beginning near well G09M and extending past well G35D. The elevation of the GMZ is about 685 feet above MSL in the eastern area to a point about 400 ft east of well G106 and then it slopes downward to about an elevation of 647 feet above MSL at well G35D. The eastern area is in the dolomite bedrock, which is below the lower zone. The dolomite bedrock was added in 2004 when the GMZ was re-evaluated.

Since the third quarter of 2004, the GMZ parameters that have exceeded the applicable groundwater quality standards (AGQSs) in the GMZ are: 1) in the upper zone, 1,4 -dichlorobenzene (one well, one sampling event), dissolved ammonia, total potassium and sodium (one well, several sampling events), and total and/or dissolved arsenic, boron, chloride, and nitrate; 2) in the lower zone, dissolved ammonia, total potassium (one well, several sampling events), and total and/or dissolved arsenic, boron, chloride, and nitrate; and 3), in the bedrock zone, 1,4-dichlorobenzene, dissolved ammonia and boron, and total and/or dissolved arsenic, chloride, and nitrate. In addition there were some exceedences of non-GMZ parameters in some wells in all three zones.

The Status Report includes a discussion of trend analyses that were done for various GMZ parameters in the three different zones. Ammonia and dissolved chloride and dissolved boron will be discussed here. Dissolved ammonia as N can be attributed to landfill activities. Concentrations in several upper zone wells exceeded the AGQS [0.9 milligrams per liter (mg/l)] during the first quarter of 2007. The highest concentration was 100 mg/l in well G15S; concentrations in this well had begun increasing in 2003 and reached a peak of 280 mg/l during the fourth quarter of 2003. Concentrations in wells G34S and G35S have been decreasing and are now in the 8 to 10 mg/l range. The concentration in well G40S has been stable to slightly increasing. Concentrations in wells G41S and R03S have been decreasing lately also. Since the 2003/2004 sampling events there have been decreasing trend in wells R03S, G15S, G34S, G35S, and G41S. Concentrations in the other wells in this zone are stable below the AGQS value. Concentrations in all lower zone wells have at one time exceeded the AGQS with the exception of wells G34D and G36S. Currently only wells G16M, G38S, G39S, and G41M have concentrations exceeding the AGQS but all have decreasing concentrations. In the bedrock zone, ammonia concentrations above the AGQS have only been seen in well G09M since the third quarter of 2004.

Dissolved chloride was originally selected as an indicator parameter for locating the GMZ. Because of concerns about other sources (road salt, water softeners, etc.) it is not now used as an indicator. Currently, only five wells in the upper zone exceed the permitted AGQS of 87.51 mg/l of chloride and only one of these exceeds the 35 IAC 620 Class I standard of 200 mg/l (in the first quarter of 2001 there were four wells that exceeded the Class I standard). Decreasing concentrations are apparent in at least five wells. Concentrations in well G15S were stable until 2003 when the concentration increased to 760 mg/l. More recently the concentration has decreased to a concentration similar to that found before the spike. In the lower zone only wells G34S, G38S, and G39S have concentrations above the AGQS in the last sampling event. Although there have been significant fluctuations in some wells, the trend graphs show the concentrations in general have decreased and become more consistent since closure began. In the

bedrock zone elevated concentrations of chloride are found in wells G09M and G13S, with an increasing trend, both wells being upgradient of the landfill. This may be an indication of a changing background.

In the upper zone at the last sampling event, concentrations of dissolved boron in five wells (G15S, G34S, G37S, G40S, and G41S) exceeded the AGQS (98 µg/l). The highest concentration was in well G15S at 660 µg/l boron. Concentrations in five downgradient wells (R03S, G15S, G34S, G35S, and G41S) have shown decreasing trends since the 2002/2003 sampling event. In the lower zone, at one time all eleven lower zone wells had exceeded the AGQS, but currently only wells G38S and G39S exceed the AGQS for boron. These wells show generally stable concentrations. In the bedrock, only well G09D had a concentration above the AGQS in the first sampling event of 2007. Concentrations in well G09D are stable with occasional fluctuations above the AGQS, and concentrations in well G13S show an overall decreasing trend with occasional fluctuations above the AGQS.

During implementation of the RI at the Site, elevated organic concentrations were a major concern. However, elevated concentrations of organics are no longer a concern since there are few detections at the present time. The one organic compound that still occasionally exceeds the AGQS is 1,4-dichlorobenzene.

Elevated methane gas levels through 2006 presented a continued concern. However, the July 2007 sampling results were all essentially non-detect. This may be an anomaly. However, it is believed that the gas migration has been brought under control and is not a concern at this time. Continued monitoring will verify this determination.

Site Inspection

The Site was inspected on June 28, 2007, by the RPM, a representative of the landfill operator, and a contractor for the operator. The Site appeared to be in very good condition. Construction of the Winnebago Energy Center was also observed. The land north of the North Unit is being prepared for a permitted landfill expansion. A house that was on the east side of Lindenwood Road, opposite the southeast corner of the Site has been removed. However, a storage shed type of building remains on the property. The landfill operators purchased this property.

Interviews

U.S. EPA's RPM discussed the Site with a representative of the landfill operator and the landfill operator's contractor. Primarily, these personnel provided clarification on work at the Site.

VII. Technical Assessment

Question A. Is the remedy functioning as intended by the decision documents?

Yes.

Review of available information indicates that the remedy is functioning as it was intended. Concentrations of contaminants have decreased over time. However, even though some of the ICs specified by the 1999 ROD have not yet been implemented, the stated objectives are being met.

Compliance with ICs is required to assure that the remedy continues to function as intended. Based on inspections and discussions, there appears to be compliance with the stated objectives of the land and groundwater use restrictions. To assure that the remedy continues to function as intended, ICs must be reviewed to assure their effectiveness, additional ICs must be implemented, and the ICs must be monitored and maintained. To that end, an IC Study will be prepared by the landfill operator to study existing ICs and determine if additional ICs are needed. An IC Plan will be prepared by U.S. EPA to incorporate the results of the study and plan for additional IC activities, as needed.

Question B. Are the exposure assumptions, toxicity data, clean-up levels, and remedial action objectives used at the time of the remedy selection still valid?

Yes.

There have been no major changes in the physical conditions of the Site that would affect the protectiveness of the remedy. The Site is being used as anticipated for the operation of a landfilling operation so the exposure assumptions that were made do not need to be changed.

The remaining applicable or relevant and appropriate requirements (ARARs) that still have to be attained deal with the quality of the groundwater. There are still significant exceedences of the AGQs. The AGQs were not specified as cleanup standards in the RODs. However, the operator must satisfy the conditions of IEPA's operating permit which will require continued monitoring of the GMZ.

While there has been a change to the MCL for arsenic (50 $\mu\text{g/l}$ at the time of the 1991 ROD to 10 $\mu\text{g/l}$ now), this is already the value specified in the IEPA permit, which the landfill operator is required to meet.

No Site uses which are inconsistent with the implemented ICs or the remedy's IC objectives have been noted during the Site inspection or discussions with the owner's representative.

Question C. Has any other information come to light that could call into question the protectiveness of the remedy?

No.

There has been no new information that would suggest that the remedy that was selected is not sufficient.

Technical Assessment Summary

According to the data reviewed, the Site inspection, and discussions with the owner's representative, the remedy is functioning as intended by the two RODs. There have been no changes in the physical conditions at the Site that would affect the protectiveness of the remedy. The concentrations of the primary substances of concern in the groundwater have been holding fairly steady. The Site is being used in a manner consistent with the required use restrictions. The additional institutional controls required under the 1999 ROD, when put into place, will complete the implementation of the remedy.

VIII. Issues

The issues identified during this review were:

- 1A. Institutional Controls--The additional institutional controls specified by the 1999 ROD need to be implemented and existing ICs need to be reviewed; and
- 1B. Institutional Controls--Along with assuring that effective ICs are in place for all areas that do not support unlimited use, long-term stewardship must be assured, which includes maintaining and monitoring effective ICs.

IX. Recommendations and Follow-Up Actions

- 1A. Institutional Controls--The landfill owner has already been directed to perform a study of the ICs and has agreed to do so.
- 1B. Institutional Controls--U.S. EPA will review the landfill owner's IC study and existing solid waste permit and develop an IC Plan to identify required follow-up actions to assure that effective ICs are in place, to plan for implementation of additional ICs as needed, and to assure that effective procedures exist for long-term Site stewardship.

Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Mile-stone Date	Affects Protectiveness? (Y/N)	
					Current	Future
1A. ICs--The ICs that have been implemented have not been fully studied to determine if they are effective. Whether additional ICs are needed and whether effective procedures are in place for long-term Site stewardship need to be studied.	The landfill owner will perform a study of the ICs.	PRP/U.S. EPA	U.S. EPA	March 2008	N	Y
1B. ICs--Along with assuring that effective ICs are in place for all required areas, long-term stewardship must be assured, which includes maintaining and monitoring effective ICs.	U.S. EPA will review the IC study and develop an IC Plan to incorporate required follow-up actions to assure that effective ICs are in place, to plan for implementation of additional ICs, and to assure that effective procedures exist for long-term Site stewardship so that the remedy remains protective.	U.S. EPA (with input from the Group)	U.S. EPA	March 2008	N	Y

X. Protectiveness Statement

The remedies for OU 1 and OU 2 are protective of human health and the environment in the short term because exposure pathways that could result in unacceptable risks are being controlled. Therefore the remedy for the entire Site is protective in the short term. Long-term protectiveness requires compliance with effective institutional controls (ICs). In order for the OU 1 and OU 2 remedies to be protective in the long term, additional ICs are necessary and the effectiveness of the ICs and long-term stewardship procedures need to be evaluated. In order for the remedy for the entire Site to be protective in the long term, the additional ICs are necessary and the effectiveness of the ICs and the long-term stewardship procedures need to be evaluated. Long-term stewardship requires that effective ICs are maintained and monitored, along with maintenance of the remedy components.

XI. Next Review

The next five-year review for the Pagel's Pit Site is required in September 2012, five years from the signature date of this review.

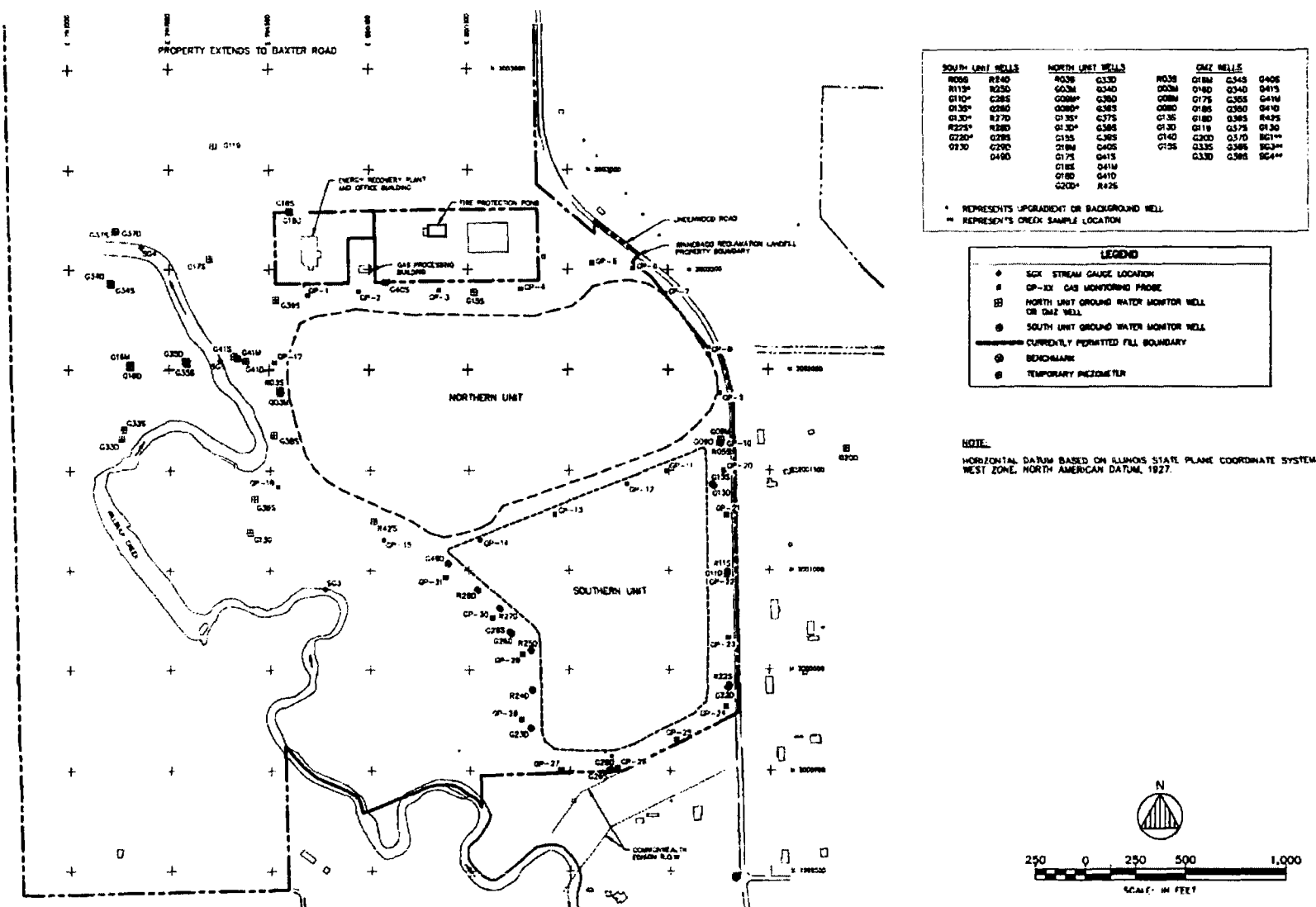
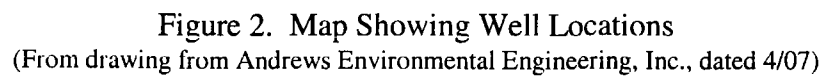


Figure 1. Map of Site and Surroundings
(From drawing from Andrews Environmental Engineering, Inc., dated 4/07)





EPA to Review Pagel's Pit Superfund Site Winnebago County, Illinois

U.S. Environmental Protection Agency is conducting a five-year review of the Pagel's Pit Superfund site. The site is located on Lindenwood Road in southern Winnebago County, Illinois. The Superfund law requires a review at least every five years at sites where the cleanup has been started and hazardous waste remains on the site. The agency conducts the review to make sure the cleanup still protects human health and the environment. This is the second such review. Construction work under Superfund was completed September 30, 1999.

Briefly, the cleanup of the site included:

- a clean landfill cover for the waste disposal area
- the extraction of polluted water and chemicals and requiring them to be sent to the local publicly-owned treatment works
- a gas extraction system, using the gas for fuel or flaring of excess gas
- monitoring the naturally occurring cleanup processes in the contaminated ground water and requiring an active system if the natural processes are inadequate
- deed restrictions, on both the property containing waste and the property with contaminated ground water, to prevent contact with contamination and use of contaminated ground water
- site monitoring, including the ground water in the southeast corner, and maintenance of all cleanup components

During the review, EPA will inspect the site, study ground-water monitoring results, and review institutional controls. Information about the site is available for review at the Rockford Public Library, 215 North Wyman Street, Rockford, Illinois. A copy of the 2002 five-year review report is available on the Internet through <http://www.epa.gov/R5Super/>.

EPA invites you to provide any information that might be important in this site review. Your information will be most valuable to reviewers if it is received by July 27, 2007. A report on the five-year review is due September 27, 2007, and will be placed in the Rockford library for public review. To provide information or ask questions please contact:

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(312) 886-4746
Toll free, (800) 621-8431, 9 a.m. - 4:30 p.m. weekdays
schorle.bernard@epa.gov

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Figure 3. Notice in *Rockford Register Star* on July 12, 2007